IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Wei Zhang et al. Art Unit : 1762
Serial No. : 09/615,999 Examiner : Brian Talbot
Filed : July 14, 2000
Title : MULTI-LAYER ARTICLES AND METHODS OF MAKING SAME

Commissioner for Patents
Washington, D.C. 20231

DECLARATION OF MARTIN W. RUPICH UNDER 37 C.F.R. §1.132

I, Martin W. Rupich, declare as follows:

1. I am a named inventor in the above-identified application.

2. I am an inorganic chemist.

3. I obtained a Ph.D. degree in Inorganic Chemistry from Northeastern University in 1980 and a B.Sc. degree in Chemistry from John Carroll University in 1974.

4. After completing my Ph.D. degree, I was employed by EIC Laboratories as a Senior Scientist from 1980 – 1992. My responsibilities at EIC Laboratories included initiating and directing work on the synthesis and characterization of high temperature superconductor materials and devices, metal oxide synthesis, electrochemistry and Raman spectroscopy; managing research and development programs; generating funding from government and private agencies; and directing a technical group of chemists, engineers and technicians.

5. I am currently employed by American Superconductor Corporation (AMSC) as a Senior Technical Staff member. My current responsibilities include the technical lead for high-temperature superconductor (HTS) development of YBCO Coated Conductor Program at AMSC. This role includes managing and directing the multiple research and development programs in the high temperature superconductivity area, preparation of technical proposals,

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

I hereby certify under 37 CFR §1.8(a) that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage on the date indicated below and is addressed to the Commissioner for Patents, Washington, D.C. 20231

March 5, 2003
Date of Deposit

Signature

Typed or Printed Name of Person Signing Certificate

management of external collaborations with private companies, National Laboratories and universities, and management of a technical team of scientists and engineers.

6. Through my educational and professional background, I am familiar with multi-layer superconductor articles that have a substrate, a superconductor layer and optionally one or more buffer layers between the substrate and the superconductor layers, as well as methods of making these superconductor articles.

7. I have reviewed the above-identified application.

8. The application as filed does not explicitly state that the process of conditioning the surface of a buffer layer does not substantially change the crystallinity of the buffer layer surface, but, after reading the application, I would understand that the process of conditioning the buffer layer surface does not substantially change the crystallinity of the buffer layer surface. The application discloses that the surface of the substrate can have a biaxial or cube texture. (Application, p. 15, line 22-p. 16, line 2.) The application also discloses that the buffer layer is an epitaxial layer. (Id., p. 22, lines 18-21; id., p. 23, lines 16-24; id., p. 24, lines 8-12.) The application further discloses that the crystallographic orientation of an epitaxial layer is directly related to the crystallographic orientation of the underlying layer. (Id., p. 2, lines 11-16.) After reading this information, I would understand that, as deposited, the buffer layer surface has substantially the same crystallinity as the substrate surface (e.g., biaxial or cube texture) because the surface of an epitaxial layer takes on the crystallinity of the surface of the layer on which it is deposited. The application further discloses that the conditioned surface has a biaxial or cube texture. (Id., p. 8, lines 7-10.) Therefore, based on the information disclosed in the application, I would understand that the crystallinity of the buffer layer surface prior to conditioning is substantially the same as the crystallinity of the buffer layer surface after conditioning.

9. The application describes the morphology of the conditioned surface as being, for example, relatively smooth and as having a high density. (Id., p. 3, line 23-p. 3, line 1.) The application further discloses that conditioning the surface "affect changes in the surface." (Id., lines 5-12.) After reading this, I would understand that the morphology of a buffer layer surface before conditioning is different from the morphology of the buffer layer surface after conditioning.

10. I have reviewed "Influence of the surface treatment on the homoepitaxial growth of $SrTiO_3$," G. Koster et al., Materials Science and Engineering, B56, pp. 209-212 (1998) ("the Koster reference"); "Improvement of $YBa_2Cu_3O_x$ Single-Crystal Surface by Chemical Etching," N. Tanaka et al., Jpn. J. Appl. Phys., 38, pp. L731-L733 (1999) ("the Tanaka reference"); U.S. Patent No. 6,022,832 ("the Fritzemeier patent"); U.S. Patent No. 5,534,41 ("the Nakamura patent"); U.S. Patent No. 5,234,901 ("the Saitoh patent"); and U.S. Patent No. 5,728,214 ("the Konishi patent").

11. The Koster reference is focused on improving the quality of a polished strontium titanate single crystal surface to correct for a miscut. (Koster, p.209.) Koster states that the polished single crystal surface does not exhibit "a clear texture." (Id., p. 210.) The Koster reference discloses two different methods of treating the polished surface. (Id., p. 209.) One method involves using "ambient oxygen" at elevated temperatures. (Id.) After oxygen exposure, Koster indicates that his "optimal" surface exhibits "a very crystalline surface." (Id., p. 211.) Koster's other method involves using an HF etchant. (Id., p. 210.) Koster discloses epitaxially growing $SrTiO_3$ on the etched surface, indicating that the etched surface is crystalline. (Id., p. 211.) Thus, both of Koster's methods of treating the polished surface result in a change in the crystallinity of the surface. As a result, I would not have considered the Koster reference if I were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning.

12. The Tanaka reference discloses a single crystal of a superconductor material (YBCO), and is directed to removing a layer of material damaged while mechanically polishing the crystal surface to yield a YBCO material having a surface with a desired crystallinity. (Tanaka, p. L731-L732.) Tanaka uses an HCl/methanol etchant to remove the damaged YBCO. (Id.) According to the Tanaka reference, Tanaka's method improves the crystallinity of epitaxial layers deposited on top of the etched surface. (Id.) Thus, Tanaka's method changes the crystallinity of his surface, and so, I would not have considered the Tanaka reference if I were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning.

13. The Fritzemeier patent is directed to forming a deposited buffer layer. (Fritzemeier, col. 7, line 48-col. 8, line 11.) To the extent that Fritzemeier discloses conditioning, it is with respect to removing contaminants from the surface of a metal alloy or substrate, not a deposited buffer layer surface. (Id., col. 2, lines 49-55; Id., col. 4, lines 14-28.) These substrates are not deposited; they are formed by other methods, such as rolling and annealing. (Id., col. 12, lines 13-16.) Therefore, I would not have considered the Fritzemeier reference if I were trying to develop a method of conditioning a buffer layer surface.

14. The Nakamura patent is directed to removing contaminants from a superconductor layer. (Nakamura, col. 3, lines 40-60.) To achieve this, the Nakamura patent discloses thermally treating the superconductor layer at temperatures above which the surface will recrystallize and below which the order of crystal of the thin film of oxide superconductor is "disturbed." (Id., col. 4, lines 3-8.) Thus, Nakamura changes the crystallinity of the surface, and so I would not have considered the Nakamura patent if I were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning.

15. The Saitoh patent discloses a method designed to "improve" the crystallinity of an oxide superconductor surface. (Saitoh, col. 2, lines 43-50.) Thus, Saitoh's method changes the crystallinity of the surface being treated. As a result, I would not have considered the Saitoh patent if I were trying to develop a method of conditioning a buffer layer surface so that the crystallinity of the buffer layer surface before conditioning was substantially the same as the crystallinity of the buffer layer surface after conditioning.

16. The Konishi patent discloses a method of heating a single crystal superconductor (not a deposited buffer layer) so that protrusions are not formed in the surface. (Konishi, col. 1, line 65-col. 3, line 23.) Therefore, Konishi's process does not change the morphology of the surface. Thus, I would not have considered the Konishi patent if I were trying to develop a method of conditioning a buffer layer surface so that the morphology of the buffer layer surface before conditioning was different from the morphology of the buffer layer surface after conditioning.

17. There is no suggestion in either the Koster reference or the Nakamura patent that the methods disclosed in these two references should be combined, and I would not have been motivated to combine the methods disclosed in the Koster reference with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Koster, p.209; Nakamura, col. 3, lines 25-37), and because the references disclose that they successfully achieve their respective goals (Koster, p. 212; Nakamura, col. 3, lines 41-54).

18. There is no suggestion in either the Koster reference or the Saitoh patent that the methods disclosed in these two references should be combined, and I would not have been motivated to combine the methods disclosed in the Koster reference with the methods disclosed in the Saitoh patent because the methods are directed to different goals (Koster, p.209; Saitoh, col. 2, lines 35-40), and because the references disclose that they successfully achieve their respective goals (Koster, p. 212; Saitoh, col. 2, line 65-col. 3, line 10).

19. There is no suggestion in either the Tanaka reference or the Nakamura patent that the methods disclosed in these two references should be combined, and I would not have been motivated to combine the methods disclosed in the Tanaka reference with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Tanaka, p. L731; Nakamura, col. 3, lines 25-37), and because the references disclose that they successfully achieve their respective goals (Tanaka, p. L732-L733; Nakamura, col. 3, lines 41-54).

20. There is no suggestion in either the Tanaka reference or the Saitoh patent that the methods disclosed in these two references should be combined, and I would not have been motivated to combine the methods disclosed in the Tanaka reference with the methods disclosed in the Saitoh patent because the methods are directed to different goals (Tanaka, p. L731; Saitoh, col. 2, lines 35-40), and because the references disclose that they successfully achieve their respective goals (Tanaka, p. L732-L733; Saitoh, col. 2, line 65-col. 3, line 10).

21. There is no suggestion in either the Fritzemeier patent or the Nakamura patent that the methods disclosed in these two references should be combined, and I would not have been motivated to combine the methods disclosed in the Fritzemeier patent with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Fritzemeier, col. 2, lines 1-11; Nakamura, col. 3, lines 25-37), and because the references

disclose that they successfully achieve their respective goals (Fritzemeier, col. 2, lines 14-18; Nakamura, col. 3, lines 41-54).

22. There is no suggestion in either the Fritzemeier patent or the Saitoh patent that the methods disclosed in these two references should be combined, and I would not have been motivated to combine the methods disclosed in the Fritzemeier patent with the methods disclosed in the Saitoh patent because the methods are directed to different goals (Fritzemeier, col. 2, lines 1-11; Saitoh, col. 2, lines 35-40), and because the references disclose that they successfully achieve their respective goals (Fritzemeier, col. 2, lines 14-18; Saitoh, col. 2, line 65-col. 3, line 10).

23. There is no suggestion in either the Konishi patent or the Nakamura patent that the methods disclosed in these two references should be combined, and I would not have been motivated to combine the methods disclosed in the Konishi patent with the methods disclosed in the Nakamura patent because the methods are directed to different goals (Konishi, col. 1, line 65-col. 2, line 8; Nakamura, col. 3, lines 25-37), and because the references disclose that they successfully achieve their respective goals (Konishi, col. 3, lines 20-23; Nakamura, col. 3, lines 41-54).

24. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application or patent issuing thereon.

Date: 3/22/2005

Martin W. Rupich